CEBAF EXPERIMENT 94-002

Photoproduction of Vector Mesons Off Nuclei

W. Brooks, V. Burkert, M.V. Kossov (Spokesperson), D. Joyce, B. Meck
M.D. Mestayer, B. Niczyporuk, E.S. Smith, R.R. Whitney, A. Yegneswar
CEBAF, Newport News, Virginia

D.C. Doughty, L. Elouadrhiri, D.P. Heddle, Z. Li
Christopher Newport University, Newport News, Virginia

S. Boiarinov, P. Degtyarenko, E. Doroshkevich, N. Pivnyuk, O. Pofore
A. Vlassov
Institute of Theoretical and Experimental Physics, Moscow, Russia

C. Hyde-Wright, A. Klein, S. Kuhn, L. Weinstein
Old Dominion University, Norfolk, Virginia

R.S. Hicks, R. Miskimen, G.A. Peterson, K. Wang
University of Massachusetts, Amherst, Massachusetts

A. Coleman, M. Eckhause, H. Funsten, J. Kane, P. Rubin, T. Tung, R. W
College of William and Mary, Williamsburg, Virginia

L. Dennis and P. Dragovitsch
Florida State University, Tallahassee, Florida

M. Gai
Yale University, New Haven, Connecticut

G.S. Blanpied, C. Djalali, B.M. Preedom* (Spokesperson), C.S. Whisna
University of South Carolina, Columbia, SC 29208
*E-mail: preedom@nuc003.psc.scarolina.edu
Ph: (803) 777-6559
Fax: (803) 777-2605

P.-Y. Bertin (Spokesperson)
Universite Blaise Pascal, F63177, Aubiere CEDEX, France

G. Audit, P.A.M. Guichon, M. Guidal, J. Marroncle, L.Y. Murphy, B. Sa
Centre d'Etudes de Saclay, F91191, Gif-sur-Yvette CEDEX, France

CEBAF Experiment 94-002

Photoproduction of Vector Mesons Off Nuclei

P.-Y. Bertin, M. Kossov, B.M. Preedom, Spokespersons

This experiment is designed to measure the properties of vector me
nuclear matter. At high baryon density the masses of vector mesons are
to change due to chiral symmetry restoration. The predicted downward sh
the vector meson masses is 10 to 20 % . The photoproduction of vector m
near threshold can be used to measure the masses and widths of vector m
embedded in nuclear matter. At CEBAF energies, the incoherent photoprod
of ρ-mesons off heavy nuclei is the ideal experiment to determine the ρ-
meson mass shift in nuclear matter. It may also be possible to measure
shift for narrow vector mesons. Because of the long decay length ($c\tau$, only a small
fraction of these vector mesons will decay inside the nucleus. However,
mass shift is predicted to be substantial relative to the natural width
decays will be easier to separate from vector mesons decaying outside o
nucleus.

Detecting the leptonic decays of vector mesons is the only reliabl
measure the mass shift of vector mesons because the hadronic decay in n
matter is always disturbed by final state interactions. The small cross
for incident photons and for secondary interactions of the outgoing el
nuclear matter makes this reaction the ideal probe for testing the prop
the dense central region of the nucleus without significant input and o
distortions. We plan to measure the $\gamma A \rightarrow e^+e^- A'$ reaction by identifying the
coincident electron pairs in the CLAS detector. Energy deposition in th
electromagnetic calorimeter, the Cerenkov counter signal, and transvers
momentum compensation define clear cuts for the separation of the e^+e^- events
from the large hadronic background.

We plan to take data on four nuclear targets simultaneously: deute
carbon, iron and lead with a beam intensity of 5×10^7 tagged photons per second
in the energy range 1.2 to 2.2 GeV (2.4 GeV). Setting the magnetic field of
the CLAS detector to half its maximum value was found to be optimal for
photon energy range. Tagged photons are to be used to determine the kin
of the reaction. In the off-line analysis, the e^+e^- mass spectra can be analyzed
under different kinematical conditions. Specifically, coherent vector m
production can be suppressed by detecting the recoiling nucleon (proton
neutron).